

I CLAIM:

1. An adapter for cooperatively engaging a plunger tip and a plunger rod for forcing molten metal from a shot sleeve into a die of a die-casting apparatus, said adapter comprising a distal end adapted to cooperatively engage the plunger tip, an opposite proximal end adapted to cooperatively engage the plunger rod, and a length between said distal end and said proximal end, said adapter having at least one passage extending from said proximal end to said distal end to permit the flow of coolant there through, said adapter being formed of a beryllium-copper alloy to facilitate the transfer of heat from the plunger tip to the coolant passing through said passage of said adapter.
2. The adapter of claim 1, wherein said at least one passage of said adapter is an axial bore.
3. The adapter of claim 2, wherein said axial bore of said adapter is along a mid-longitudinal axis of said adapter.
4. The adapter of claim 1, wherein said at least one passage of said adapter is generally uniform in cross section along the length of the adapter.
5. The adapter of claim 1, wherein said at least one passage of said adapter has an enlarged cross section adjacent said distal end of said adapter.
6. The adapter of claim 1, wherein said at least one passage of said adapter has a frusto-conical shape adjacent said distal end of the adapter to facilitate the flow of coolant through said passage and to increase the size of the cooling chamber available to cool the plunger tip.
7. The adapter of claim 1, further comprising an o-ring between said adapter and the plunger tip and an o-ring between said adapter and the plunger rod.
8. An apparatus for forcing molten metal from a shot sleeve into a die of a die-casting apparatus, said apparatus comprising:
 - a plunger rod having a distal end and an opposite proximal end, said plunger rod having at least one coolant passage extending from said distal end toward said proximal end to permit the flow of coolant there through, said at least one passage of said plunger rod having an enlarged cross section adjacent said distal end of said plunger rod; and

a plunger tip having a distal end adapted to contact the molten metal and an opposite proximal end having an inner diameter being threaded to cooperatively engage said plunger rod, said plunger tip having a cooling chamber adapted to receive coolant from the coolant passage of said plunger rod.

9. The apparatus of claim 8, wherein said at least one passage of said plunger rod has a frusto-conical shape adjacent said distal end of said plunger rod to facilitate the flow of coolant through said passage and to increase the size of said cooling chamber available to cool said plunger tip
10. The apparatus of claim 8, further comprising an o-ring between said plunger rod and said plunger tip.
11. The apparatus of claim 8, wherein said plunger tip is formed of a beryllium-copper alloy.
12. The apparatus of claim 8, wherein said plunger tip has an annular wall adapted for sliding sealing engagement with an internal surface of the shot sleeve.
13. The apparatus of claim 8, wherein said plunger rod has an exterior portion adjacent said distal end that is threaded,
14. The apparatus of claim 8, wherein said plunger rod is in fixed relation to said plunger tip.
15. An apparatus for forcing molten metal from a shot sleeve into a die of a die-casting apparatus, said apparatus comprising:

a plunger tip for forcing molten metal from a shot sleeve into a die of a die-casting apparatus, said plunger tip comprising a distal end adapted to contact the molten metal, an opposite proximal end having an inner diameter being threaded to cooperatively engage a threaded exterior portion of a plunger rod, and a length between said distal end and said proximal end, said plunger tip having a cooling chamber, said plunger tip being formed of a beryllium-copper alloy to facilitate the transfer of heat from the plunger tip to coolant passing through said cooling chamber, said plunger tip having an outer diameter of at least 5.5 inches and an inner diameter of no greater than 2.0 inches; and

one of a plunger rod and an adapter, said one of a plunger rod and an adapter having a distal end, an opposite proximal end, and at least one coolant

passage extending from said distal end toward said proximal end to permit the flow of coolant there through, said at least one passage having an enlarged cross section adjacent said distal end.

16. The plunger tip of claim 15, wherein said plunger tip has an annular wall adapted for sliding sealing engagement with an internal surface of the shot sleeve.
17. An apparatus including a plunger rod adapted for cooperative engagement with an adapter adapted for cooperative engagement with a plunger tip for forcing molten metal from a shot sleeve into a die of a die-casting apparatus, said plunger rod comprising a distal end, an opposite proximal end, and a length between said distal end proximal ends, a exterior portion of said plunger rod adjacent said distal end being left hand threaded, said left hand threaded portion of said plunger rod being adapted to cooperatively engage an adapter adapted to cooperatively engage a plunger tip, said plunger rod having at least one coolant passage extending from said distal end toward said proximal end to permit the flow of coolant there through.
18. The apparatus of claim 17, further comprising an adapter having a distal end adapted to cooperatively engage the plunger tip, an opposite proximal end adapted to cooperatively engage said plunger rod, and a length between said distal end and said proximal end, an interior portion of said adapter adjacent said proximal end being left hand threaded to cooperatively engage said left hand threaded portion of said plunger rod, a portion of said adapter adjacent said distal end being right hand threaded to cooperatively engage the plunger tip, said adapter having at least one passage extending from said proximal end to said distal end to permit the flow of coolant there through.
19. The apparatus of claim 18, wherein said adapter is formed of a beryllium-copper alloy to facilitate the transfer of heat from the plunger tip to the coolant passing through said passage of said adapter.
20. The adapter of claim 18, wherein said at least one passage of said adapter has a frusto-conical shape adjacent said distal end of the adapter to facilitate the flow of coolant through said passage and to increase the size of the cooling chamber available to cool the plunger tip.

21. The adapter of claim 18, further comprising a plunger tip having a distal end adapted to contact the molten metal and an opposite proximal end having an inner diameter being right hand threaded to cooperatively engage the right hand threaded exterior portion of said adapter, said plunger tip having a cooling chamber adapted to receive coolant from said coolant passage of said adapter.
22. The adapter of claim 18, wherein said at least one passage of said adapter has an enlarged cross section adjacent said distal end of the adapter.